An AMATEUR'S TELEVISION

There are two general television transmission systems in use today. First, is by means of the whirling disc and the second by means of tubes. The second classification is divided between the kinescope, used by RCA, and the Director, used by Pan Am on the West Coast. Neither of these latter tubes are available to the amateur.

There were three of us who became interested in the subject of television: George Sharp of Sioux City, Iowa; Ernest Kroblick of Cresco, Illinois; and myself. We discussed the design of an experimental wired television system that would operate on the same lines as the commercial. Later put it on the air. However, we knew that we were not able to obtain an iocoscope and that is where our difficulties began.

Close inspection of the iocoscope revealed that it is to effect a cathode ray tube with a metal plate placed in such a manner that it will be scanned by the electron ray. The ordinary cathode ray tube shows the electron ray up against a coated glass screen at the end of the tube and the ray, when striking the screen, bears it to a sufficient extent to make it luminous. Our problem, therefore, was to construct either an iocoscope or a tube which could be used in its place. We soon gave up the tube construction idea and concentrated on using the available tubes that are on the market today. Television transmitters described below is the result of our experiments. While it will not receive a living person, it will transmit pictures from film negatives or it could be used to transmit motion picture film.

The system of transmission of the negative is quite unique in that it incorporates the cathode ray tube as the heart. The difference between our system and the iocoscope was that while the iocoscope scans an image inside of the tube, we were able to scan an image outside of the cathode ray screen. This was done by placing a negative flat against the end of the cathode ray tube and transmitting the ray through the glass and the film, collecting it in an Ely cell upon which it had been focused by means of a series of lenses. Then, there would be our "iocoscope." The lens we used was an ordinary photographic convex type which can be purchased in any supply store. Our system had one drawback. There was not enough light hitting the Ely cell to operate the modulator for the ordinary speech input.

Our second big problem, therefore, was to design an amplifier which would amplify the very small amount of energy obtained from the Ely cell sufficient to modulate a small transmitter.

A lot of different things had to be taken into consideration. Firstly, the amplifier had to pass a very wide range of frequencies, from 20 to 1,500,000 cycles with a constant output over the entire frequency range. We determined we had to have at least a 60-volt output from the amplifier in order to properly excite the drivers and the modulator of the transmitter.

In order to avoid distortion, the ca-
TRANSMITTER

by ANTHONY KOWALEWSKI, WYCU

The transmitter is a small, compact box, designed to be portable and easy to use. The power supply is internal, and there is a built-in frequency meter. The transmitter can be used for shortwave broadcast or for long-distance communications.

The transmitter can also be used to transmit Morse code, with a Morse key included in the package. The transmitter has a built-in microphone, allowing for hands-free operation.

The transmitter comes with a user manual and a warranty. It is a high-quality, reliable transmitter that is sure to meet the needs of any amateur radio enthusiast.
in parallel insofar as the power circuits go.

High voltage power supply for the cathode tube can be seen directly behind the amplifier in the picture at the top of the page. It uses a single 866 rectifier and operates on the half-wave rectification system. The current drain from this power supply is one milliampere and it will not cause any voltage fluctuation in the power supply when this is used. A full-wave system could be used, but the cost would be exorbitant. The diagram fully explains the component parts and their hook-up. It also gives the necessary voltages for checking.

After the high voltage supply has been completed, the sweep circuits should next be commenced. The cathode ray sweep circuit and its associated power supply is shown. The controls in the front of the panel are from left to right, the horizontal amplitude control, the horizontal frequency control, the block-out control, frequency control and the vertical amplitude control. This sweep circuit operates the horizontal and vertical amplifiers of the cathode ray oscilloscope. It utilizes two 885 discharge tubes and two 58 tubes. The supply power to which it is connected by means of a cable and plug arrangement contains a power transformer; a type 3Z2 choke and the condensers in filter arrangement. Two power supplies are mounted on this chassis, one for the sweep circuits and the other for the amplifier. The transformers are mounted along the rear side of the sweep circuit chassis and 2½ volt filament transformers are used to light all of the heaters in the transmitter.

After the oscilloscope power supply and sweep circuits have been completed it will be well to test them with an oscilloscope. In the event that the sine wave input is not available for test purposes, 60 cycle current may be put upon horizontal or vertical plates through a 0.002 mfd. mica condenser. If everything is in order, the oscilloscope should operate as is customary.

The amateur is now ready for the construction of the difficult part, the amplifier. Component parts are all listed in the diagram itself. Procure a chassis 35 inches long, 10 inches wide and 6 inches high. Divide this into six compartments, each of approximately 6 x 10 inches in size. The tubes should be mounted in each compartment as shown in the photograph, making certain that all wiring is as short as possible. Do not purchase anything but the very best parts. Check each resistor at the time of the purchase, and be sure that the values are exact and use the ohmmeter as a reference rather than the printed label upon the part. A few ohms difference in the various resistors might unbalance the amplifier and will make a great deal of difference in the performance of the finished product. Mount the Ely cell on the outside of the chassis to the extreme left and proceed with the wiring and construction as is indicated jointly by the diagram and the photograph.

After the amplifier has been completed tubes should be inserted and it should be checked for hum by turning on all of the filament and the voltage to each tube. If any hum is present it will show on the cathode ray tube in the receiving position. Hum must be removed before the amplifier can be put into television operation.

By means of the lenses, focus the beam of the transmitting cathode ray tube upon the Ely cell. If everything is in order, a square frame of light should appear on the receiving tube at the other end of the amplifier. Both cathode ray tubes are connected in parallel as is indicated in the diagram. If the diagrams, pictures and hints herein contained, have been followed, and the apparatus tested, the picture can now be televised.

Place a sharp contrast negative up against the end of the cathode ray in the transmitting position. Turn on all filaments and tubes. If everything is working right, a positive reproduction should appear on the receiving C. R. tube screen. You are now ready to put the television transmitter on the air.

Because of the wide frequency range of video signals, it is impossible through a transformer plate to modulate any transmitter. Grid modulation, therefore will have to be resorted to. The modulator and driver should now be constructed. We used a pair of 10's as modulators and a pair of 10's as RF final amplifiers.

Feeding the output of the amplifier at points x-x into a pair of 45's in push-pull as is indicated in the diagram, we fed that to 10's operating in Class A. Here again the diagram is self-explanatory. The output of the 45 drivers is fed through a low impedance network to the modulators. These, in turn, grid modulate another pair of 10's acting as final RF amplifiers. The crystal and exciter circuit in the RF section has not been drawn since it is well-known to almost every amateur.

In order that amateurs who have different types of receiving sets, as well as any short wave listeners who might be dropped in to give you a report, can tune you in, the following procedure is one we adopted with considerable success.

Fire up your regular transmitter, call "CQ Television," or "CQ Video." Do not turn on the Video transmitter. When you make a contact, inform the person receiving, that you wish to transmit a video signal. The person receiving will need the following information. First, the wavelength in KC upon which you expect to transmit your video signal: second, the horizontal scanning frequency; and third, the vertical frequency of the image.

Actually in practice, it works out something like this, W9... calls CQ on 59.9 MC. Receiving a reply, he advised the recipient to watch for the video signal on 58 MC and gave him the horizontal scanning frequency of 5760 cycles and the vertical frequency of 24 cycles.

The recipient then tunes his television receiver to 58 MC and set his cathode ray sweep circuit to the horizontal frequency of 5760 cycles and the vertical frequency of 24 cycles. By doing this, the transmitter and the receiver were in synchronization. Transmitted signal and picture came through with considerable clarity. Audio or voice transmission must be at least 1.5 MC removed from the video signal.

The transmitter we described does not transmit any signal of a synchronizing nature, but it does enable the amateur to start on his way with television. As we see it, in the future amateurs will call "CQ Video" and receiving an answer, will transmit their video signals. The receiving amateur will set up the necessary components in his receiving oscilloscope to synchronize with the transmission. Wide variation from 60 cycles on the AC line will prevent the picture from being received properly.

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Courtesy of Joe Sousa